

Cicada Mania Hits the Eastern United States

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Introduction

Periodical cicadas, *Magicicada* spp., emerge in specific locations once every 17 years in the northern part of their range and once every 13 years in the southern part. Every year periodical cicadas emerge somewhere in the eastern United States. The different groups that emerge each year in different locations are called “broods.”

The group that emerged in 2004 is known as Brood X (Brood 10) and is the largest of the 17-year cicadas. The last time Brood X emerged was in 1987 and occurred in parts of 15 states from New York to Georgia to Illinois and Michigan. Media coverage of the emergence of Brood X began as early as January because of the massive numbers of insects expected to appear on the scene and the negative response that these insects were expected to stimulate in people who live in areas where the emergence occurs.

Periodical cicadas belong to the insect order Homoptera, so they are sucking insects. When viewed head-on, or from the side, the adults vaguely resemble giant aphids. Although cicada adults have sucking mouthparts, they do very

little feeding, and their feeding damage is considered insignificant.

The female cicadas produce the most dramatic damage when they lay eggs. They deposit eggs by jamming their long, sturdy ovipositors through the bark and into the wood of twigs and small branches. They prefer oviposition material with a diameter of 1/4 to 1/2 inch. The females usually inch forward as they lay eggs, producing longitudinal slits.

Multiple oviposition slits may kill the twigs and small branches, producing a symptom called “flagging.” On a large tree, the damage is of minimal consequence to the overall health of the tree. However, damage on small trees may have a significant impact on tree health when a high percentage of branches are affected.

The literature indicates that females may lay eggs on more than 270 species of plants, including most of the deciduous tree species found in Ohio. Some of the more unusual hosts include Rose of Sharon, rose, raspberry, grape, black-eyed Susan, hollies, spirea, rhododendron, viburnum, junipers, and arborvitae. Egg laying has even been observed on annuals and herbaceous perennials.

However, lists of possible oviposition hosts should always be viewed “through the lens of common sense.” The nymphs

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that hatch from the eggs cannot move far from the oviposition host selected by the females, and the nymphs need to feed for 17 years. Rarely are cicadas a significant threat to herbaceous plants in home gardens and landscapes.

Periodical cicadas are truly a fascinating biological phenomenon. After spending 13 to 17 years feeding, growing, and developing under the soil, they emerge from the soil somewhat synchronously to become adults. Most nymphs in a particular area crawl out of the soil within a few nights of one another.

In Ohio, in 2004, Brood X was expected to emerge in scattered locations throughout much of the western half of the state. Some locations had huge populations while others had little or no populations, which, though a relief to most, was disappointing to entomologists living in those areas. Distribution maps of where and when the different broods of periodical cicadas emerge can be found on Ohio State University Extension Fact Sheet HYG-2137-99, *Periodical and Dog-Day Cicadas*, and on several sites on the World Wide Web — e.g., <http://bugs.osu.edu/~bugdoc/PerioCicada/>.

Periodical cicadas cause a lot of excitement when they appear for several reasons. First, in some areas, hundreds of thousands of these 1-1/2"-long insects are found per acre, sitting on everything and flying through the air. For people who don't like insects, massive numbers of insects surrounding them can be quite disturbing.

Second, the song the adult males produce is very loud and, multiplied by thousands, the noise can be deafening. Often the males synchronize their singing and can be heard more than one-half mile away.

Third, although the adults do not feed excessively, females can damage trees and shrubs by depositing eggs in slits they produce in twigs and stems. The splintering of the wood and bark of the small twigs and stems may result in twig dieback. Fourth, some pet owners discover their dogs and cats eating the emerging cicada nymphs.

Chorusing is used by male cicadas to attract the females. The sound is produced by very obvious white-colored structures called tymbals located beneath the hind wings on each side of the top of the abdomen. Males congregate en masse in trees and react to one another with their songs rising and falling in unison. Females also produce sounds, but they use their wings. In response to the male's love song, the females vibrate their wings. This "wing flick" behavior produces a soft, rustling broad-frequency sound, or a sharp snapping noise.

Massive brood emergence is believed to overcompensate for the feeding of predators, which are mostly birds. This ensures that enough survivors will be left behind to reproduce. Male cicadas are capable of making a loud buzzing noise and squawk when disturbed. The males often synchronize their buzzing in trees, producing a deafening noise. It is believed that such droning and squawking is effective in deterring predators.

Cicadas and Quackers

The availability of large numbers of insects in a concentrated area can cause changes in behaviors of many different animals, resulting in unusual and sometimes mysterious looking symptoms. During a plant diagnostic event at Spring Grove Cemetery and Arboretum in Cincinnati, participants observed hundreds of round or oval-shaped holes about 1" to 1.5" in

diameter and 3" deep throughout a rain-saturated area under some trees. The size of the holes and lack of soil mounded around them indicated that they were not periodical cicada emergence holes, although there were many of those in the area.

The holes were too neat and small to be the work of raccoons digging for cicada nymphs or other subterranean insects. Further observation revealed the causative agent of the holes when a trio of mallard ducks waddled under the trees. The mallards, far from a pond or other water, began drilling their bills into the soil with a twisting motion until their eyeballs were barely visible above the soil line. They were enjoying the once-in-a-lifetime (for a duck) opportunity to fatten up on cicada nymphs and, in the process, were leaving the tell-tale holes as evidence of their good fortune.

Mallards are not alone in taking advantage of the plentiful supply of protein in the form of insects. Numerous birds, snakes, moles, and other mammals will stuff themselves with the easy prey. Unfortunately, family pets — dogs and cats — will also consume excessive numbers of the cicadas, with resultant regurgitation after a short period of time.

Trees Under Wraps

Increased public awareness of the Brood X emergence escalated concerns as to how to prevent severe damage to tender plant materials. The management tactic adopted by many homeowners was to wrap critical plants in various coverings in an attempt to prevent female cicadas from ovipositing in twigs and branches. Many misuses or misunderstandings as to how to use tree canopy coverings to prevent oviposition were observed in different areas of the state.

Some examples of misuse included trees wrapped two to four weeks earlier than necessary; trees wrapped too tightly, with cloth spiraling around compressed branches and held firm from top to bottom by rope bindings, producing what appeared to be "tree-mummies;" and some tree canopy coverings where cloth was secured only to the trunk and basal branches of the tree. With this latter approach, the upper canopy was left uncovered and susceptible to oviposition damage.

Covering small, newly planted trees with light-weight cloth (*e.g.*, cheese-cloth), netting (openings 1/4" or less in size), or other appropriate material will prevent cicada oviposition injury. This is a recommended practice in areas where high cicada populations portend significant damage to small trees.

However, this method of reducing cicada damage is not without risk to the "protected" trees. Here are some common-sense points to consider:

- Trees should not be covered until the cicada emergence is under way. Delay covering trees until you see the first cicadas on the plant. Male cicadas emerge first followed by females, and oviposition does not immediately occur.
- Tree-covering material should not significantly interfere with the passage of light to the canopy. This is particularly important for trees that require full sun to thrive.
- The material should allow for good airflow, keeping foliage dry and less susceptible to fungal infections. Good airflow across leaf surfaces also cools the foliage and supports evapotranspiration, a process that is important to water and nutrient uptake by the tree.

- The covering material should be kept loose over the canopy. Limbs and foliage should not be compressed.
- Covering material should be removed periodically and reapplied as needed. This will keep new growth from becoming deformed by the cover. Cloth material should also be removed when weather reports predict strong storms that include high winds. Otherwise the material may act as a wind-sail, causing damage to branches and main stems.
- Using tree canopy covers to protect against oviposition damage should be treated as a short-term endeavor. Long-term use of some materials for covering trees may produce noticeable damage to the tree. Cicada activity should be closely monitored, and the tree covers removed as soon as oviposition activity has abated.

Cicada Observations

Ohio State University Extension personnel kept a close watch on the development of the Brood X cicadas from the start of their late springtime activities until well after the singing of the males had ceased. Selected observations made through the cicada event are presented here:

- Early evidence of periodical cicada activity was seen in the form of mud tubes appearing in turf. These tubes were built by nymphs 3 to 5" above the soil, apparently to escape water-saturated soils. The tubes are similar to those constructed by crayfish but are smaller in diameter (circa April 1 to 8, 2004).
- In Ohio, cicada emergence started in Cincinnati and spread northward from there. It was noted that periodical cicada activity started as a trickle of individuals but progressed rapidly to a roar over about a 10-day period (May 15 to May 24). The cicada males started chorusing in unison during this time, mating began, and oviposition was also observed. It was reported that cicadas were in full emergence in the Columbus area as well, but male chorusing and mating were at their beginning.
- Cicada species composition varied from location to location. It was noted that *M. cassini* was the only species found in Cincinnati. Localized segregation among the three periodical cicada species common to Brood X (*M. cassini*, *M. septendecula*, and *M. septendecim*) is not an uncommon occurrence. *M. cassini* tends to be found in dry, upland locations. All three species were found in central Ohio.
- Observers of periodical-cicada-infested plants reported observing a soft "rain" falling from trees heavily populated by cicadas. Some described it as looking like a fine mist as it was being reflected in shafts of sunlight filtering through tree canopies. Cicadas are sucking insects, and they do feed. The observed "cicada-dew" is analogous to the "honey-dew" excreted by aphids (circa May 20 to 27, 2004).
- Heavy oviposition on a wide range of trees and shrubs was observed throughout the Cincinnati area. The subsequent dieback of branch tips, or flagging, was just becoming evident, primarily on oaks in early June (circa June 3 to 10, 2004).
- As the periodical cicadas began to die, a new problem developed — the smell of decay. As quickly and synchronously as the cicadas appeared, they were also dying. Dead cicadas were raining down from heavily infested trees in many locations. Reports of foul odors from the accumulating dead cicadas

were received from many areas in the Brood X range (circa June 10 to 17, 2004).

- The construction of new distribution maps for Brood X is required since observations of Brood X's appearance or lack of appearance were recorded. There was considerable discontinuity of cicada populations within the reported range of Brood X. The historical method of using clusters of counties as a basis to delineate brood emergence boundaries does not accurately depict the actual population distribution.
- Brood X was observed to have redistributed over short distances to previously non-infested areas. Cicada watchers reported that they had observed large numbers of cicadas appearing in areas where there was little or no emergence from the ground. This movement was generally in close proximity to localized cicada "hot spots."
- Some possible reasons for the often dramatically uneven distribution of periodical cicada populations within the historical boundaries of Brood X include:
 - ▲ Brood X in Ohio primarily occurs in the western half of the state, an area with a long history of field-crop production and limited wooded areas.
 - ▲ Ohio is one of the fastest urbanizing states in the United States, and loss of mature trees as well as heavy soil disturbances most likely resulted in loss of cicada nymphs.
 - ▲ A more speculative reason could be the impact of unidentified pathogens.
- Although the presence of the adult Brood X cicadas was relatively short

lived, their impact will be evident for several years. Flagging was most visible on oak and beech, particularly European beech, but oviposition damage occurred on numerous plants. In areas where other broods of periodical cicadas were active in other years, considerable amounts of twig and branch dieback and breakage occurred for two to three years after the cicada event.

- In areas of extremely heavy periodical cicada emergence, millions of dead bodies dropped from trees and the odor of decay became overpowering. Some tried to put a recycle spin on the event by telling homeowners that the bodies are actually good fertilizer, being rich in nitrogen, phosphorus, and potassium. In fact, recent research at sites in the eastern United States show that this "resource pulse" from cicada decomposition is real and may explain long-known observations of tree growth ring increases following years of cicada emergence.

Summary

Brood X emergence began in early May (May 4 to 11, 2004), and the adult activity extended into late June to early July (June 29 to July 8, 2004), although their impacts will be felt for several years to come. During the cicada emergence, and subsequent adult activity, Ohioans living in heavily infested areas met the onslaught with a range of reactions, from genuine curiosity and amazement, to taciturn acceptance, to mild panic. Their sentiments are epitomized by a few selected farewells — "goodbye garish gadflies," "adios transient troubadours," and "don't let the door slam on your ovipositor on the way out."

